(5) *Perchlorate of Lead*, $2(Pb\,ClO_4)+3H_2O$.

Perchlorate of lead is an extremely deliquescent salt; it is best prepared by dissolving carbonate of lead in perchloric acid. The salt may be dried *in vacuo* over sulphuric acid without losing water.

		Calculated.	Found. I.	Found. II.
2Pb	207·0	45·00	44·82	44·74
$2ClO_4$	199·0	43·26	42·22	
$3H_2O$	54·0	11·74		
	460·0	100·00		

I desire to acknowledge the able assistance I have received from M. Schorlemmer in carrying out the above experiments.

December 19, 1861.

In consequence of the lamented Death of His Royal Highness The Prince Consort, no Meeting took place.

January 9, 1862.

Major-General SABINE, President, in the Chair.

The President, on the part of the Council, submitted to the Meeting the following Address of Condolence to be presented to the Queen:—

We, YOUR MAJESTY'S most dutiful and loyal subjects, the President, Council, and Fellows of the Royal Society of London for improving Natural Knowledge, desire humbly to offer to YOUR MAJESTY the sincere expression of our sorrow for the irreparable loss which YOUR MAJESTY and the nation have sustained by the death of HIS ROYAL HIGHNESS THE PRINCE CONSORT.

While we deeply share in the universal lamentation which this great calamity has called forth, we claim the mournful privilege of giving expression to our special grief for the loss of a Prince who, to his other high qualities and claims to the nation's esteem and gratitude, united a just appreciation of the importance to mankind

of those pursuits to which the Royal Society is devoted, and an earnest desire to aid in their advancement.

That it may please Divine Providence to soften the affliction of YOUR MAJESTY and Your Royal Family, and support you in this heavy trial, is the earnest wish and prayer of YOUR MAJESTY'S loyal and devoted subjects, the President, Council, and Fellows of the Royal Society of London.

On the motion of the Lord Chief Baron, seconded by Mr. Heywood, it was Resolved,—That the Fellows do most cordially concur in the Address now read from the Chair.

The Address was then signed by the President on behalf of the Council and Fellows.

The following communications were read:—

I. "Preliminary Note on the Nature and Qualities of Voltaic Currents." By GEORGE GORE, Esq. Communicated by Professor STOKES, Sec.R.S. Received January 9, 1862.

1. In a recent paper "On the production of Vibrations and Sounds by Electrolysis," I have shown that if a voltaic current of suitable quantity from two Grove's or five Smee's elements is passed by a mercury anode through a solution composed of 10 grains of cyanide of mercury and 100 grains of hydrate of potash, dissolved in $2\frac{3}{4}$ ounces of hydrocyanic acid containing 5 per cent. of anhydrous acid, into an annular cathode of mercury about 2 or 3 inches diameter and $\frac{1}{8}$th of an inch wide, *visible* and symmetrical *vibrations* of the negative mercury, accompanied by definite *sounds*, are produced; and the current becomes *intermittent* as long as the vibrations continue, similar to a current made intermittent by means of an ordinary break-hammer.

2. If two voltaic currents of suitable and *equal quantity* (measured by a voltameter in the circuit), the one being generated by about eight Smee's elements of large immersed surface, and the other generated by twenty Smee's elements of small surface, are passed separately through the arrangement just described, vibrations and sounds are in each case produced; but with the current from the few

elements of large surface the amplitude of the vibrations is small and the sound high, whilst with the current from the many elements of small surface the amplitude of the vibrations is large and the sound base. These differences in the vibrations and sounds are still more conspicuous if a galvanometer of small resistance (*i. e.* with a short and thick wire) is substituted for the voltameter, and about four Smee's elements employed instead of the eight. In each of these experiments the voltameter (or galvanometer) is in the circuit with the cyanide solution; the quantities of the two currents are made equal by suitably adjusting the relative depths of immersion of the plates of the two batteries; and each experiment (with the voltameter) occupies 3 minutes. The size of the mercury electrodes has also been previously adjusted to the power of the current, so as to give continuous definite vibrations and sounds.

3. Further:—If a current from two Grove's or five Smee's elements of large surface is passed through a primary coil of about 250 feet of thick copper wire, through the cyanide solution and small-resistance galvanometer, the vibrations are moderate in size and the pitch of the sound is moderately high; but if the axis of the coil contains a massive bundle of soft iron wires, the vibrations are much larger and the pitch of the sound is much more base; and if the primary coil is surrounded by a secondary coil containing about 4000 feet of fine copper wire, the ends of which are closely united together, and the iron core is absent, the vibrations are very much smaller and the sound is much higher. In each case the *quantity* of the current, however, remains the same. If a voltameter is used instead of the galvanometer, a greater number of elements (about eight Smee's) must be employed, and the difference in the effects is then less striking. If a battery of much greater intensity, say twenty Smee's elements, is employed, no difference in the vibrations or sounds is produced by the introduction of the soft iron core, nor by closing the secondary coil.

Do not voltaic currents therefore of equal quantities from different sources, or under different external conditions,* like heat and light from different sources, *possess different qualities?*

4. From these results (as well as from additional ones that I have

* I employ the word "quantity" in its ordinary sense, viz. as that indicated by measurement of gases from decomposition of water in a voltameter.

obtained) it appears to me that voltaic electricity, like heat or light, may be viewed as consisting of *vibrations* or *successive impulses*, which under ordinary circumstances occupy so minute a period of time as to be inappreciable, but when acting under suitable conditions upon suitable substances, such as the metal and liquid referred to (1), the vibrations of the current are taken up by the substances, and the oscillations of the substances thereby produced are gradually increased by the synchronous impulses of the current until they become visible and attain their maximum (see paper "On the production of Vibrations and Sounds by Electrolysis," paragraph 11), like visible oscillations of a pendulum produced by minute synchronous mechanical impulses. This I beg leave to state as an hypothesis for the purpose of making the subject more clear and aiding future inquiry.

Note by the Communicator.

[The results mentioned in this paper are well worthy of attentive consideration, in relation to that curious and still mysterious phenomenon which the author is investigating with so much care. As regards, however, the conjecture thrown out by the author,—while the importance of such a conclusion as that of the existence of qualitative differences in permanent electric currents, according as few or many voltaic elements are concerned in their formation, or of periodicity as a *necessary* condition of a voltaic current, if fully established, cannot be overrated, the conclusion does not seem to the Communicator of the paper to be fairly deducible from the experiments described. It would rather seem that, from some cause yet to be investigated, the motion of the mercurial cathode, or rather the change of figure resulting from the motion, alters the total electromotive force or resistance (more probably the resistance) in the circuit, and thus, by altering the current, reacts upon the forces whereby the motion of the cathode is produced. In a circuit of small resistance, it might be expected according to this view that a smaller motion of the cathode would suffice to bring about a given change in the current, and a corresponding change in the force producing the motion, and accordingly that the period of the changes would be shorter than in a circuit of greater resistance, although the

mean currents in the two circuits, as measured by a galvanometer or voltameter, might be the same.]

II. "On the Diurnal Tides of Port Leopold, North Somerset." By the Rev. SAMUEL HAUGHTON, M.A., F.R.S., Fellow of Trinity College, Dublin. Received November 7, 1861.

(Abstract.)

The present is the first of a series of communications on the tides of the Arctic Seas which the author hopes to lay before the Royal Society. The MS. materials at his disposal embrace both the Atlantic and Pacific Arctic Tides, for which he was indebted to the Hydrographer, Captain Washington, R.N., to Captain Collinson, R.N., Captain Sir F. Leopold M'Clintock, R.N., and Captain Rochfort Maguire, R.N.

The present paper discusses fully the diurnal tide of Port Leopold, which is most remarkable from the proportion which it bears to the semidiurnal tide, a proportion which is unusually large. From the discussion of this tide, the author is enabled to announce with confidence several results or laws which he had previously obtained and published from the discussion of the small diurnal tides of the coasts of Ireland.

These results are given in detail in the paper itself. In the concluding portion of the paper, the author calculates, from received dynamical theories, the depth of the Atlantic Canal, from the proportion of the Solar to the Lunar coefficient, from the Diurnal Solitidal and Lunitidal Intervals, and from the Age and Acceleration of the Luni-diurnal Tide.

He hopes to forward shortly the discussion of the Semidiurnal and Parallactic Tides of the same locality.